Changes to the Underground Facility

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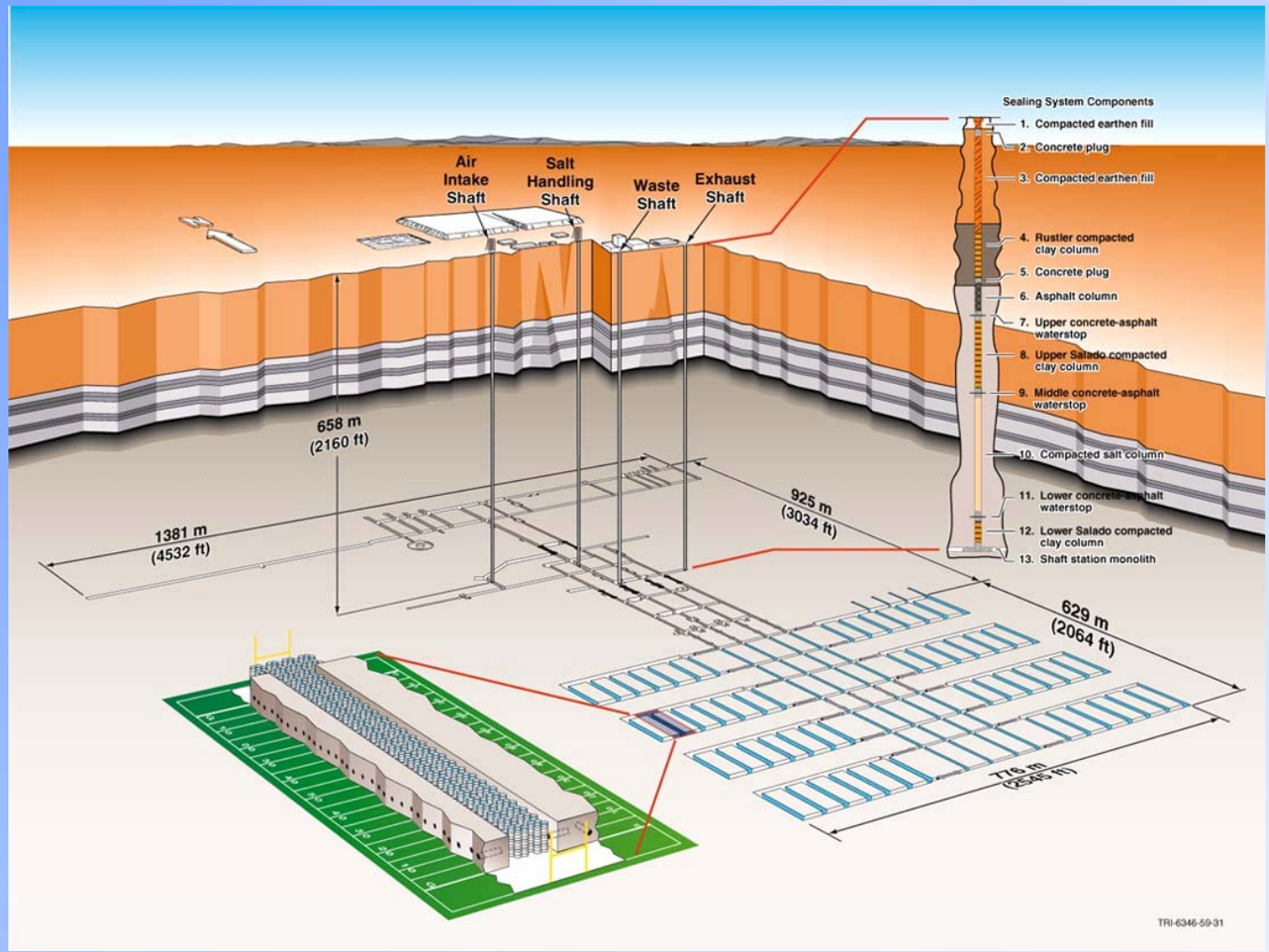
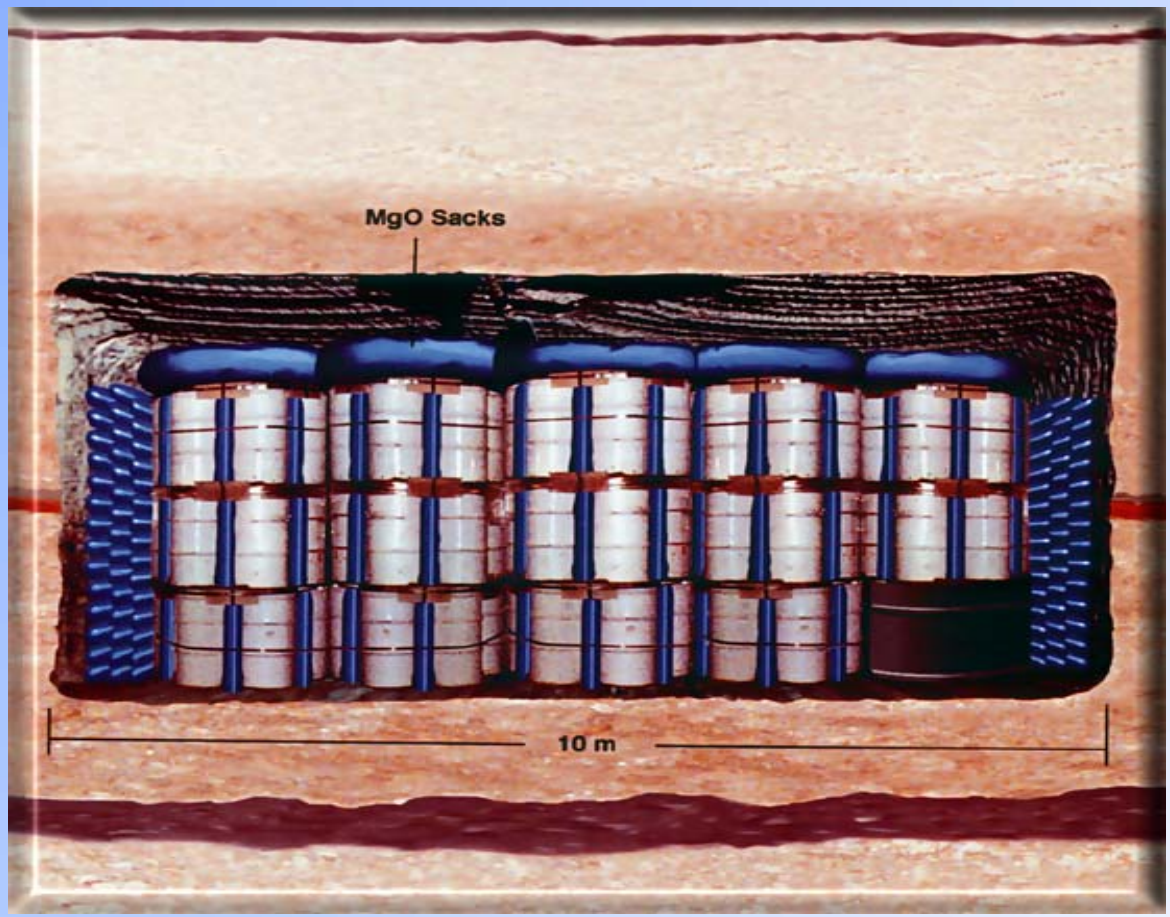
The Underground Facility



Waste Emplacement

Note: The MgO mini-sacks have now been removed



Changes to the Underground Facility

There have been four changes

- **Mining Horizon Change:**
  - **Move the rooms up so that the roof is at Clay G to improve operational stability**
- **Change in MgO Supplier**
- **Change in MgO Placement:**
  - **Removal of “mini-sacks” to increase worker safety, and reduce worker exposure**
- **Panel 1 Utilization:**
  - **Partial filling because of creep closure and stability issues caused by the age of the panel**

Changes to the Underground Facility

Mining Horizon Change

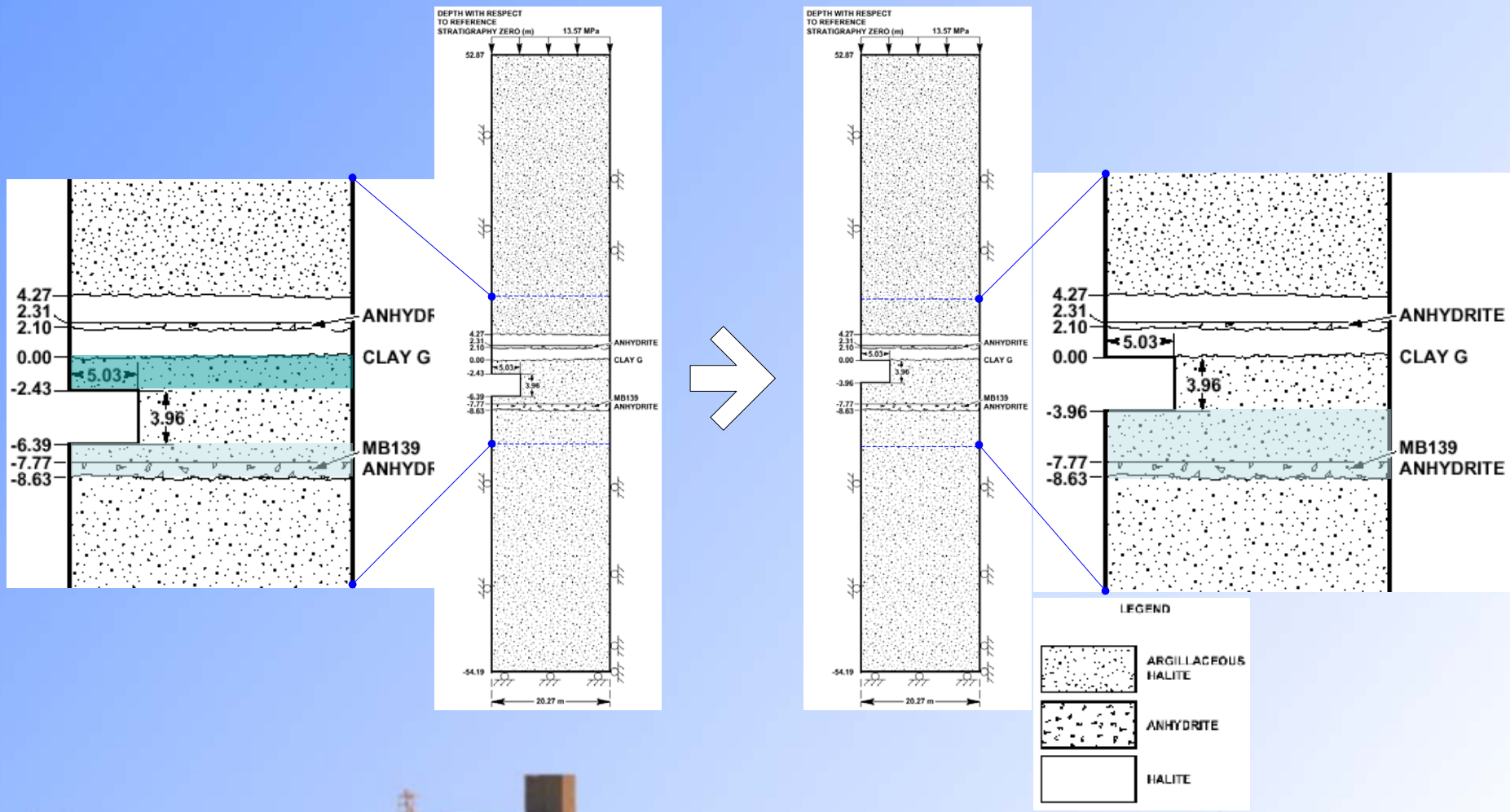
Background

- **June 26, 2000: DOE submitted a planned change to raise the repository horizon in the southern panels (3, 4, 5, 6, and 9) by approximately 2.4 m (6.6 ft) so that the back (roof) is at Clay Seam G. This was requested to improve roof stability – the roof beam up to Clay G tends to fracture over time.**

- **Aug 11, 2000: EPA approves: *"we agree that [the horizon move] will enhance operational safety without significantly affecting the long-term performance of the facility"***

- **Aug 6, 2002: EPA letter to DOE: "*the conceptual model for the repository should reflect the change to raise the level of excavation to clay seam G. The conceptual change should be appropriately addressed in the modeling, if warranted*"**

Elevation change

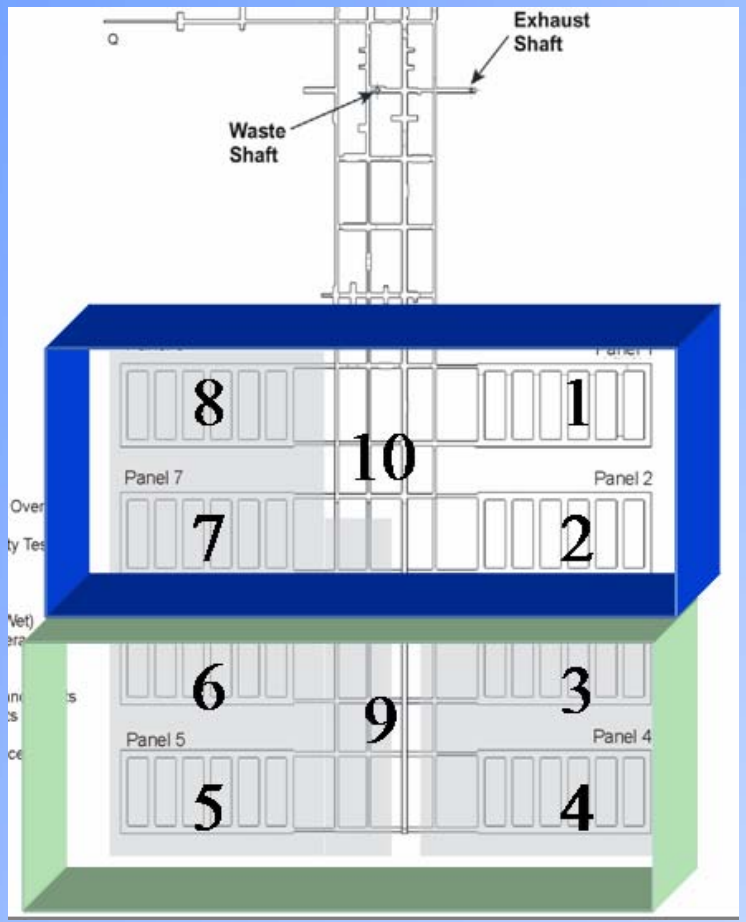


Fractures up to Clay G

Background

- **By moving the room up 2.4 m, the back is at Clay G (Anhydrite b is also removed) and the floor is 2.4 m further above MB139. Having Clay G at the top of the pillars reduces the shearing stresses in the roof, and a wider roof beam does not deflect so much. The results are:**
  - **a more stable back configuration**
  - **a reduced rate of roof-beam deformation, and slower development of fractures.**
  - **reduced risks during mining and waste handling,**
  - **less ground control maintenance is required.**

The Clay Seam "G Plan



Panels 3, 4, 5, 6, and 9 will be ~2.4 meters higher than panels 1, 2, 7, 8, and 10.

Conclusions

- **Probability of Borehole Intersection - *unchanged***
- **Spalling and Direct Brine Releases – *negligible long-term effect***
- **Castile Brine Reservoir - *negligible long-term effect***
- **Marker Bed 139 – *small beneficial effect***
- **Clay Seam F and Room Sidewalls - *negligible long-term effect***
- **Roof Rock Bolts – *generally beneficial***
- **Floor Loading – *no long-term effect***
- **Anhydrite Layer b - *negligible long-term effect***

"The impacts of the plan on long-term repository performance appear minimal and are not expected to affect compliance adversely" *(Summary: EPA Review of Clay Seam G Mining Plan – Marcinowski, August 11, 2000)*

PA Implications

- **Aug 6, 2002: EPA letter to DOE: "*the conceptual model for the repository should reflect the change to raise the level of excavation to clay seam G. The conceptual change should be appropriately addressed in the modeling, if warranted*"**

- **PA studies showed that the change in horizon was inconsequential with regard to long-term performance – will be discussed in a later talk**

Changes to the Underground facility

MgO Vendor Change

Function of MgO as an Engineered Barrier

- **MgO is used to sequester the CO_2 produced by microbial degradation of cellulosics, plastics and rubbers (CPR), and thus to control the pH.**
- **This reduces uncertainty in repository conditions, and creates conditions that reduce actinide solubilities.**
- **In addition MgO will remove water from the system (although this is not accounted for in PA)**
- **MgO originally emplaced in 4,000 lb. super-sacks and in 25 lb. mini-sacks**

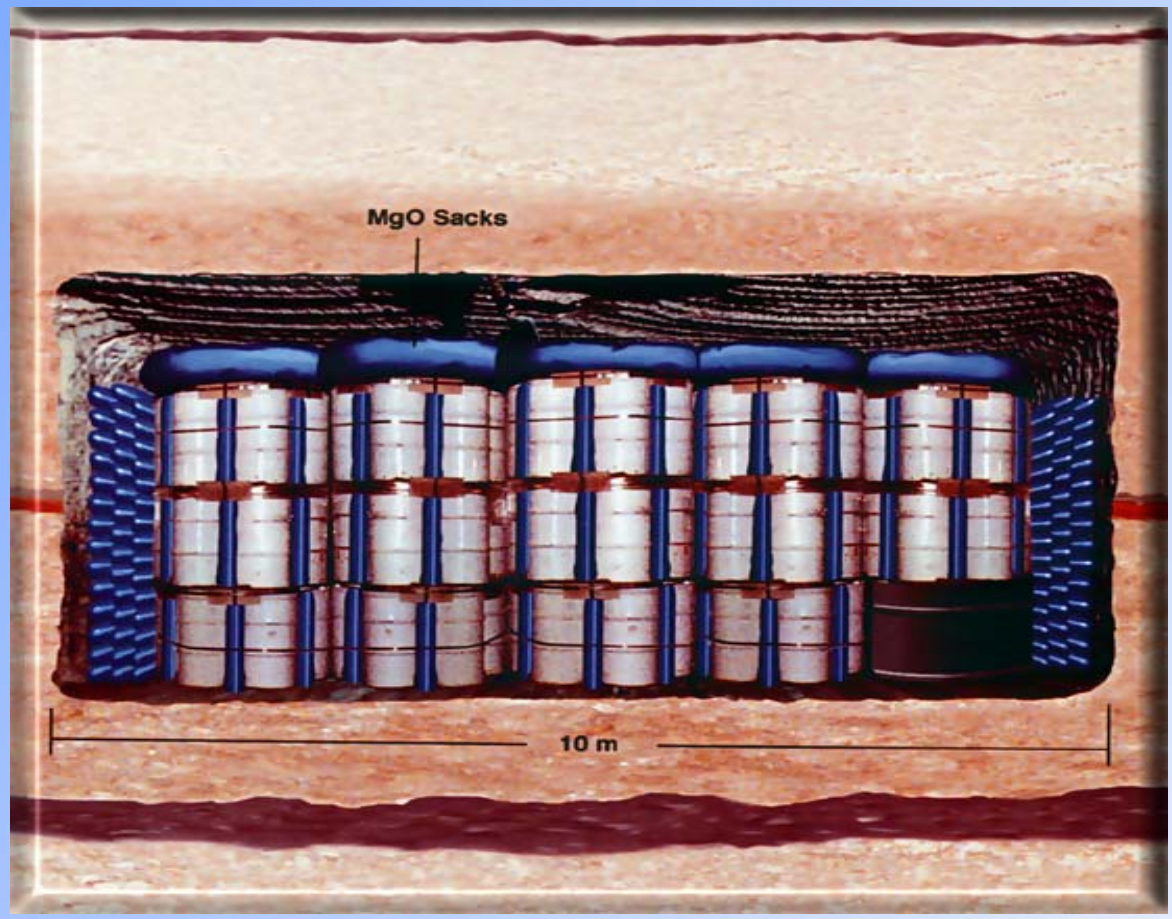
Change in MgO Vendor

- ***In 2000 Magnesium oxide was no longer available from the original supplier.***
- ***The new MgO product from a new supplier:***
  - ***Meets the technical criteria established in the specifications.***
  - ***An evaluation by the DOE of the properties showed that the change has no impact on the expected performance of the repository.***
  - ***Contains slightly less MgO (10% is CaO and impurities): the volume in the sacks was increased by approximately two percent so that they contained the same weight of magnesium-oxide***
- ***The DOE notified EPA of the change in supplier in a letter dated February 10, and in its Annual Change Report (ACR) dated November 30, 2000.***

Changes to the Underground facility

MgO Placement Change

Waste Emplacement



Background

- **Jul 21, 2000: DOE requested EPA approval to eliminate magnesium oxide mini-sacks to enhance worker safety:**
  - **Manually emplace 18 25lb. Mini-sacks around drums per waste stack and 11 against rib for each row**
  - **Requires bending, lifting and use of ladders**
  - **Reduce radiation dose (ALARA)**
- **Elimination of the mini-sacks resulted in a 15 percent reduction in the total mass of magnesium oxide emplaced in the WIPP, but maintained an excess over that required to sequester all possible CO_2.**

EPA Response

In a letter dated January 11, 2001, the EPA agreed with the elimination of the magnesium-oxide mini-sacks.

- **"MgO is still expected to remove CO_2 and to affect pH and actinide solubility**
- **the excess amount of MgO proposed for emplacement ensures that adequate MgO will still be available to provide expected chemical effects**
- **the plan for emplacing MgO remains feasible.**

The elimination of the MgO mini-sacks is not significant to long term repository performance. DOE's proposal to decrease the amount of MgO in the WIPP by 15% by eliminating the MgO mini-sacks is acceptable."

Changes to the Underground facility

Panel 1 Utilization

Background

- ***The rooms of Panel 1 were over 12 years old at the time the change request was submitted. The natural processes of room closure had reduced the vertical clearance to the extent that remining would be necessary to provide sufficient headroom and acceptable floor conditions for waste to be emplaced as described in the CCA, i.e., three containers high.***
- **April26, 2001:** ***DOE requested approval to use a different utilization plan for Panel 1 for worker safety and operational efficiency. Specific requests were to:***
  - ***Leave rooms partially filled, or totally unfilled as needed***
  - ***Stack the waste either 1, 2 or 3 high***
  - ***No RH was to be emplaced in Panel 1***

Damage in the Floor of Panel 1, Room 2, August 21, 2001.

EPA Response

- **June 22, 2001: EPA requested more information on:**
  - **Roof fall**
  - **Backfill**
  - **Impact of unused rooms**
  - **Waste loading**

and restricted the use to 3 high stacking until these issues were resolved

- **June 29, 2001: DOE responded, removing the request for 1 or 2 high stacking, which removed the first 2 issues**

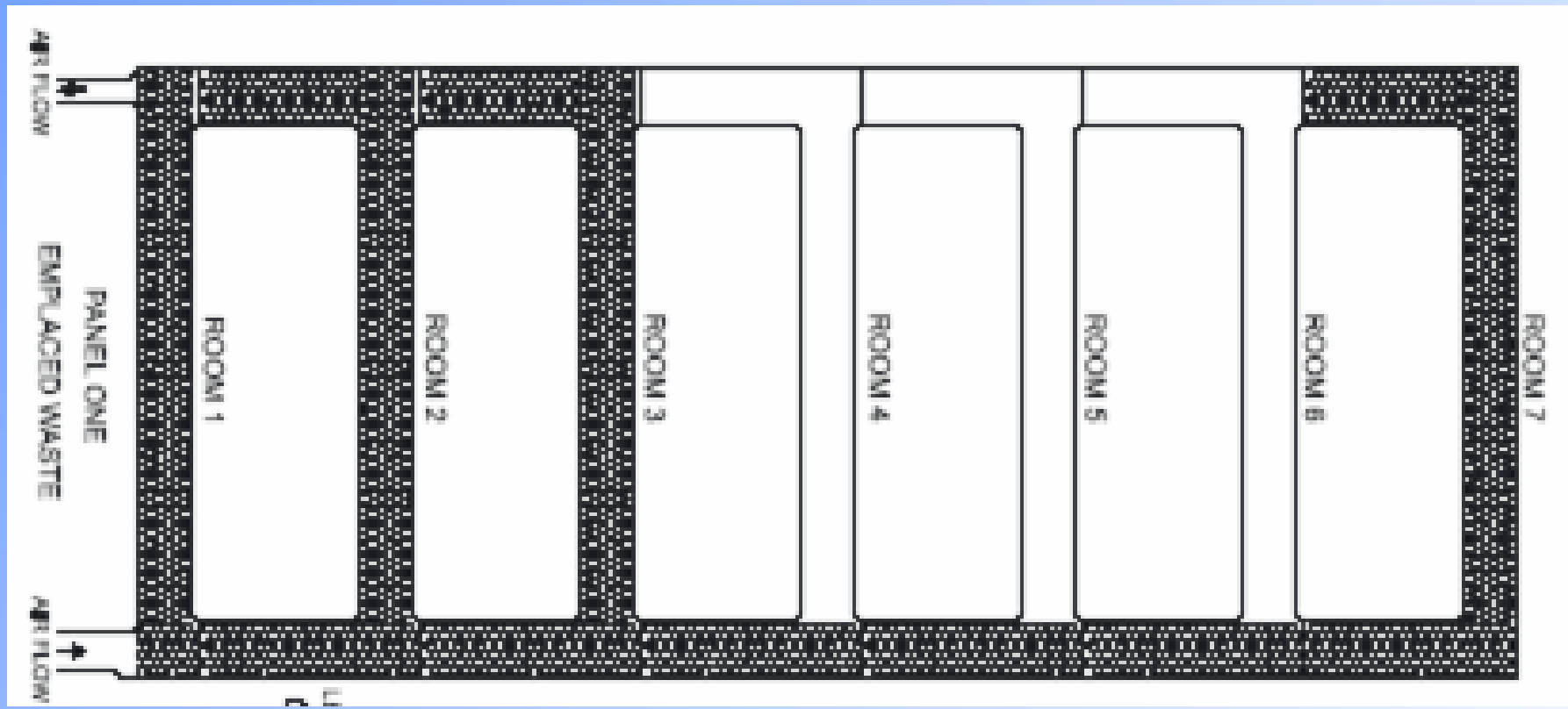
- **August 7, 2001: EPA approved:**
  - **Use of all, or part, or none of the space in each of the rooms in Panel 1 for CH-TRU waste disposal**
  - **Closure of Panel 1 without emplacement of any RH-TRU waste**

as these changes "will not increase projected certification releases and are insignificant to long-term performance"

Current Situation in Panel 1

- ***Disposal operations in Panel 1 are complete and an explosion wall has been installed closing the Panel: this is the first stage of the "Option D" closure. Completion of the closure has been delayed until a request for a design change has been resolved.***
- ***Not all rooms are filled. Those filled have waste emplaced in the 3-high stacks.***

Panel 1 Waste Emplacement



Summary

- **The underground is unchanged except for:**
  - **Raising the rooms so that the back is at Clay G in the southern panels**
  - **MgO from a new vendor, and the mini-sacks (15% of the MgO) have been removed**
  - **Panel 1 has been closed without filling all of the rooms.**

- **These changes have been approved after a thorough study by DOE and EPA. Their effect on the long-term performance of the repository has been shown to be insignificant.**